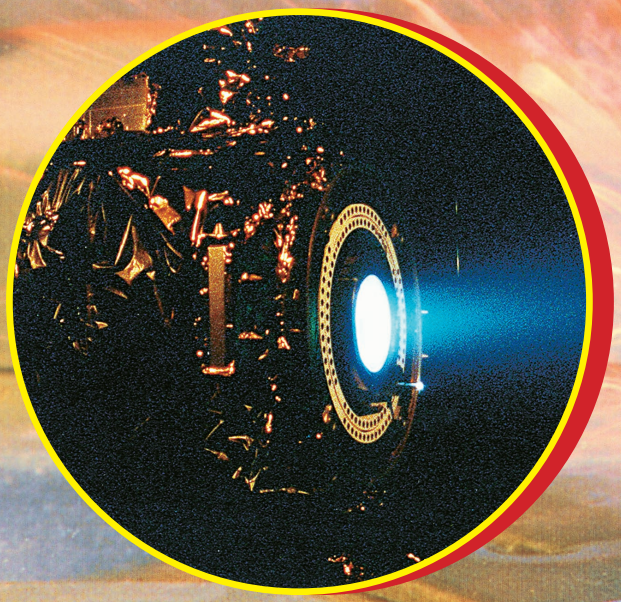
UNIT 2

Energy and Momentum



OVERALL EXPECTATIONS

DEMONSTRATE an understanding of work, energy, impulse, momentum, and conservation of energy and of momentum.

INVESTIGATE and analyze two-dimensional situations involving conservation of energy and of momentum.

DESCRIBE and analyze how common impact-absorbing devices apply concepts of energy and momentum.

UNIT CONTENTS

The motion of water, subjected to 4000 kPa of pressure, has sufficient energy to cut through steel. The motion of electrically charged particles, propelled at speeds in excess of 3.0×10^4 m/s, could provide the energy needed to power space probes in the near future. In the small photograph of an experimental ion engine, the blue glow is composed of electrically charged ions of xenon gas, travelling at speeds in excess of 3.0×10^4 m/s. An ion engine emits even smaller high-speed particles than a water-jet cutting tool.

In this unit, you will build on previous studies of energy to include another concept: momentum. Momentum considers the amount of motion in an object and the effect of moving objects — large or small, solid, liquid, or gas — on each other. You will use the concepts of energy and momentum to analyze physical interactions, such as collisions and propulsion systems. You will also examine two great theoretical foundations of physics: the law of conservation of momentum and the law of conservation of energy.

UNIT PROJECT PREP

Refer to pages 262–263 before beginning this unit. In this unit project, you will create a presentation that explores the importance of scientific theories.

- What theories do you already know that are helpful in analyzing changes in the motion of an object?
- In what career fields are ideas, principles, or mathematical techniques used to analyze the motion and interactions of objects?